

**The status of *Brycon labiatus* STEINDACHNER 1880 (Pisces, Characoidei)
and its synonym, *Othonophanes labiatus* (STEINDACHNER 1880)**

by

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Abstract

A reversible skin enlargement in the middle part of the lower jaw appears when *Brycon* cf. *melanopterus* is exposed to hypoxic conditions. The form and relative size of this lip is similar to that described as the specific characteristic of *Brycon labiatus* by STEINDACHNER (1880) and later made the definitive feature for the genus *Othonophanes*. This is not a constant characteristic, as previously thought. It is much more likely a dermal structure induced by hypoxia, as demonstrated experimentally for *B. cf. melanopterus*. This is assumed to be produced by other species of the genus *Brycon*, and it is therefore proposed that *B. labiatus* with its synonym *Othonophanes labiatus* be considered a *species inquirenda*.

Keywords: taxonomy, characteristic, morphology, alteration, hypoxia

* With support of the German Research Society and of the Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) and the Instituto Nacional de Pesquisas da Amazônia, (INPA), Manaus, Brazil

Recently, HOWES (1982) provided an extensive review of the genus *Brycon*. With about 60 nominal species, it is one of the largest neotropical genera of its suborder, Characoidei, and has representatives in various parts of northern South America and Central America. A revision of this genus has not yet been undertaken, and there is much taxonomic uncertainty, making specific identification problematic or impossible in most cases (GERY 1977).

In 1880, STEINDACHNER described the species *Brycon labiatus* in his "Beitrag zur Fischfauna des Rio Cauca und der Flüsse bei Guyaquil" (Contribution to the knowledge of the fish fauna of the Rio Cauca and the rivers near Guyaquil). It was distinguished by a peculiar formation on the middle part of the dentale.

After providing morphometric and meristic data on a 24 cm specimen, STEINDACHNER provided an extensive, detailed description, including the statement: "Der Zwischenkiefer überragt nach vorne ein wenig den Unterkiefer, an dessen Vorderrande die sehr stark entwickelte Unterlippe lappenförmig herabhängt und unten beiderseits in eine dreieckige Spitze ausgezogen ist". (The intermaxillary extends slightly anterior to the lower jaw, the front edge of which supports the very highly developed lower lip, that is drawn into a triangular tip and has a pair of lobes hanging downward).

Elsewhere he wrote, "Durch die überaus starke Entwicklung der Unterlippe, welche wie ein breiter Lappen von dem Vorderende des Unterkiefers frei nach unten herabhängt, unterscheidet sich diese Art, von der mir leider nur ein Exemplar zur Beschreibung vorliegt, auffallend von den übrigen bisher bekannten, ziemlich zahlreichen *Brycon*-Arten, und erinnert in der allgemeinen Form des vorderen Teiles der Unterlippe an manche *Chalcinus*-Arten, z. B. *Ch. magdalenae* STEIND., *Ch. angulatus* SPIX & AGASS., *Ch. culter* COPE, (s. STEIND., Ichthyol. Beitr. V; Zur Fisch-fauna des Magdalenen-Stromes)." (The exceedingly strong development of the lower lip, which hangs down like a wide lobe from the entire front end of the lower jaw, distinguishes this species, very clearly from the fairly numerous *Brycon* species already known. The general form of the anterior part of the lower lip is reminiscent of certain *Chalcinus* species, e. g., *C. magdalenae* STEIND., *C. angulatus* SPIX & AGASS., *C. culter* COPE. (STEIND., Ichthyol. Beitr. V; Zur Fisch-fauna des Magdalenen-Stromes)).

The figures 1 and 2 show that the lip from which the specific name is derived is apparently a strongly pigmented dermal organ.

EIGENMANN (1903) attached greater importance to the lip formation than STEINDACHNER had and made it the definitive characteristic for a new genus, *Othonophanes*. The etymology of the new word stresses the characteristic: *οὐρόν* means napkin, and *φαίνω*, to show.

HOWES (1982) cast doubt on the rank EIGENMANN (1903) assigned to the lip as a taxonomic characteristic by mentioning that there is a certain amount of interspecific variability in the lip extension within *Brycon*. STEINDACHNER (1902) also later described a specimen of *Brycon labiatus* from the Rio Magdalena near Baranquilla that was basically similar to the holotype in body shape, dentition on the jaws, number of fin rays, and the body scale counts. The lower lip, however, was narrow, had a sharp edge, and did not hang like a broad lobe over the edge of the lower jaw, as it did in the type specimen. STEINDACHNER (1902) thought it possible that the difference could be due to sexual dimorphism.

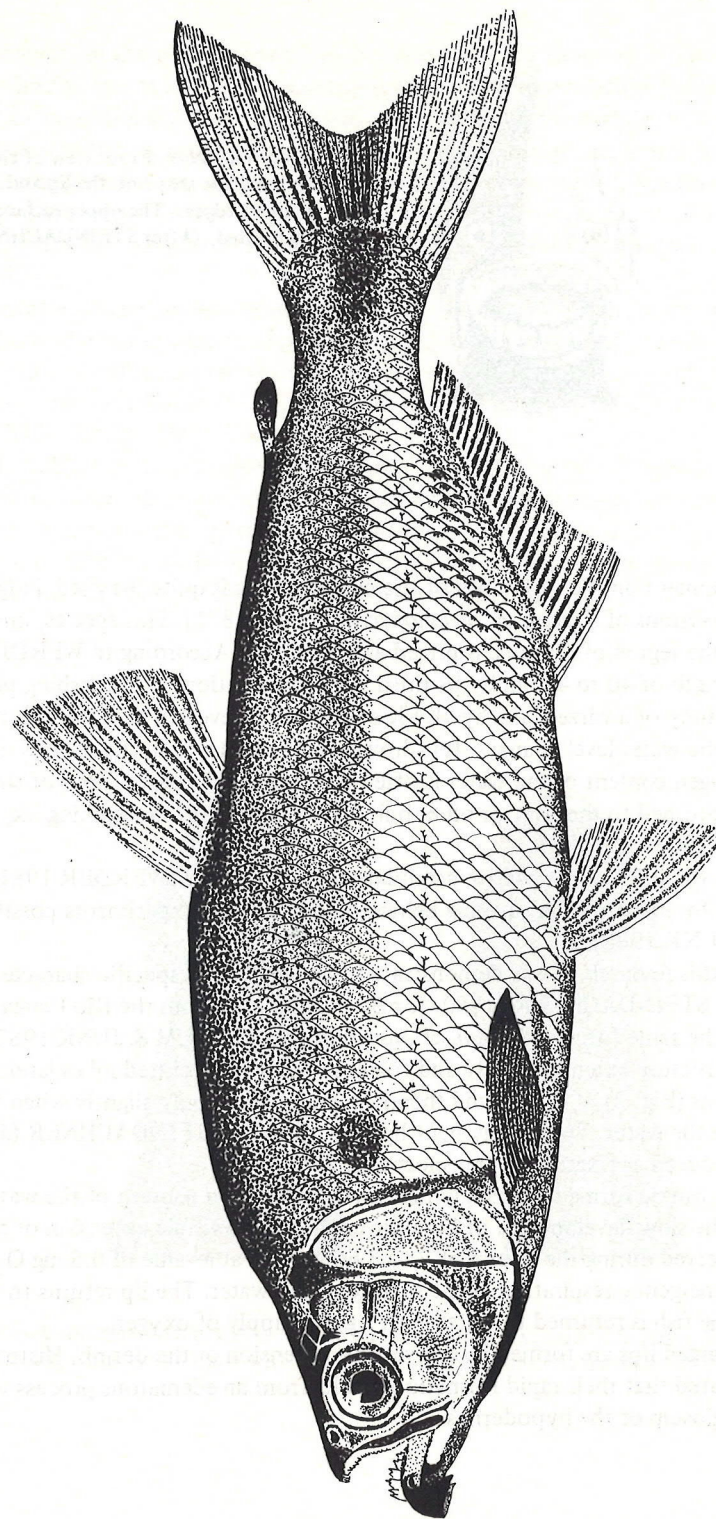


Fig. 1:
Brycon labiatus STEINDACHNER 1880.

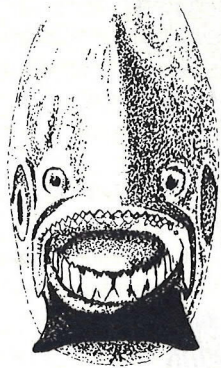


Fig. 2:
Brycon labiatus: Front view of the head showing the shape of the lip and its extended, pointed edges. The upper surface is strongly pigmented. (After STEINDACHNER 1880).

This comment on the variability of the characteristic is quite justified, judging from my own observations of *Brycon* cf. *melanopterus* (COPE 1871). This species, known as the matrinhã in the region of Manaus, is prized as a food fish. According to WERDER (1983), it reaches a length of 40 to 42 cm by its third year. Observations of the fishing practices and an extensive study of a várzea lake by JUNK et al. (1983) revealed that the fish migrates seasonally as the water level changes. It is, however, encountered in the regions of the várzea where the oxygen content of the water is often very poor and, where fishes of the other species have returned to the river or other habitats in response to the sinking oxygen concentration (JUNK et al. 1983).

Because the fish is an attractive candidate for aquaculture (WERDER 1981), it was kept in ponds for investigation, making behavioral studies and experiments possible (BRAUM & JUNK 1982).

During this research, it was demonstrated that the species specific characteristic designated by STEINDACHNER (1880) for *Brycon labiatus* from the Rio Cauca was developed in the same form by *Brycon* cf. *melanopterus* (BRAUM & JUNK 1982; BRAUM 1983). This structure extends distally and forms more or less pointed lobes laterally. On living specimens (Fig. 2), it is rigid and therefore hangs down only slightly when the fish is removed from the water. The greatly bent lips described by STEINDACHNER (1880) could have been produced as fixation or transport artifacts.

The lips can be formed amazingly fast when the oxygen content of the water sinks. Even during the slow development of hypoxic conditions, a visible extension of the lower lip can be observed during the course of 2 to 3 hours, and at a value of $0.5 \text{ mg O}_2 \text{ l}^{-1}$, the fishes begin emergency respiration at the surface of the water. The lip returns to its original shape when the fish is returned to water with a good supply of oxygen.

The enlarged lips are formed by a reversible extension of the dermis. Histological findings indicated that their rapid formation results from an edematous process within the stratum spongiosum of the hypodermis.

The analyses of the phenomenon indicate that there is a functional relationship between the lip formation and the emergency respiration behavior of the fish at the surface. Under hypoxic conditions, *Brycon* cf. *melanopterus* swims at the surface of the water and apparently takes in the layer directly in contact with the atmosphere, which is rich in oxygen through diffusion. According to all available information, the hypothesis that the extended lips serve a hydrodynamic purpose is correct. Their tissue structure gives no evidence that the lips themselves serve a respiratory function (BRAUM & JUNK 1982; BRAUM 1983).

Comparable reversible skin enlargement in the middle region of the lower jaw has also been observed and induced by experimental hypoxia in juvenile *Triplotheus* sp. (BRAUM 1983), as well as on the serrasalmids, *Colossoma macropomum* (CUVIER 1818) and *Colossoma bidens* (SPIX in A. 1829) by BRAUM & JUNK (1982) and *Piaractus nigripinnis* (COPE) by BRANSON & HAKE (1972).

It is probable that a lip formation induced by partial pressure of O_2 and important for the survival strategy in oxygen-poor water habitats, similar to that in *Brycon* cf. *melanopterus*, occurs in other species of the genus. The shape and relative size of the structure described by STEINDACHNER (1880) indicate that it was actually one of these lips. *B. labiatus* should therefore be considered a *species inquirenda*.



Fig. 3:
Brycon cf. *melanopterus* (COPE 1871). The lip on an individual exposed to hypoxia (left) compared to a specimen from water with high oxygen concentration (from BRAUM & JUNK 1982).

Summary

In the description and assignment of the name to *Brycon labiatus*, later called *Othonophanes labiatus*, the typical distinguishing characteristic was reported to be a dermal enlargement of characteristic form in the mid-dental region (Fig. 1, 2).

Brycon cf. melanopterus develops a structure of extremely similar size and shape when exposed to hypoxic conditions for a period of two to three hours (Fig. 3). When the oxygen concentration increases again, the lip reverts to its original form. Observations of the fish's behavior indicated that the lip is a hydrodynamic organ that aids the fish during its emergency respiration at the surface.

The reversible formation of the enlarged lip on the lower jaw is assumed to occur among several species of the genus *Brycon*. It is therefore proposed to consider *Brycon labiatus* as a *species inquirenda*.

Zusammenfassung

Durch Beschreibung und Namensgebung hervorgehobenes Typusmerkmal von *Brycon labiatus* resp. *Othonophanes labiatus* ist eine dermale Vergrößerung des mesialen Dentalbereiches von charakteristischer Form (Fig. 1, 2).

Brycon cf. melanopterus hat eine in Form und GröÙe außerordentlich ähnliche Bildung die durch Hypoxie im Verlauf von zwei bis drei Stunden hervorgerufen werden kann (Fig. 3). Wieder ansteigender Sauerstoffgehalt führt zu ihrer völligen Rückbildung. Nach Verhaltensbeobachtungen wird diese Lippe als ein hydrodynamisches Organ bei der Notatmung an der Wasseroberfläche angesehen.

Es wird vermutet, daß diese reversible Lippe am Unterkiefer ein bei der Gattung *Brycon* mehrfach vorkommendes Merkmal ist. Daher wird vorgeschlagen, *Brycon labiatus* als *species inquirenda* anzusehen.

Resumo

O característico do tipo *Brycon labiatus* resp. *Othonophanes labiatus* que é acentuado pela descrição e pelo nome é uma aumento dermal da região dental mesial com forma típica (Fig. 1, 2).

Brycon cf. melanopterus mostra um fenómeno extremamente similar em forma e tamanho que pode ser provocado por hipoxia dentro de 2 - 3 horas (Fig. 3). Quando o teor de oxigênio aumenta, o lábio volta a sua forma normal. Segundo observações do comportamento este lábio é considerado um órgão hidrodinâmico durante a respiração de emergência na superfície da água.

Supõe-se que o lábio reversível na maxila inferior é um característico comum da espécie *Brycon*. Por isso, é recomendado de considerar *Brycon labiatus* uma "*species inquirenda*".

Acknowledgments

Thanks are due to Mrs. Carmen Stürwold for providing the figures.

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Accepted for publications in August 1983